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The Impact of Minimum Wage Increases on Automotive Production: A Comparative Analysis of the United States, Japan, and China

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Abstract

This study explored the effect of minimum wage has on automotive vehicle production, with data analysis from the United States, Japan, and China. This study aims to offer a more comprehensive answer through case studies and data collection focused on the automotive sector in selected countries. To analyze the impact of minimum wage on production, we collected data on major strikes leading to minimum wage increases in the United States, Japan, and China. We then ran a linear regression model to uncover the correlation between minimum wage fluctuations and automotive production during each respective year. Our analysis revealed a negative correlation between automotive production and minimum wage in the United States, whereas Japan and China exhibited a positive correlation. The observed disparities may be attributed to the variations in minimum wage levels, the availability of skilled workers, and the real wealth of each country. Other factors, such as government policies, economic cycles, and shifts in demand, may also significantly influence the impact of minimum wage on production levels. Future research should consider longer timeframes, more specific regional and industry segment analyses, and multivariate regressions to account for external factors and strengthen the causal link between minimum wage increases and automotive production.

Keywords

Minimum Wage; Automotive Production; Comparative Analysis; Labor Policy.

1. Introduction

The relationship between minimum wages and production rates is a contentious issue with wide-reaching ramifications, evident in debates spanning from macroeconomic growth to firm-level competitiveness. Although higher minimum wages may increase unemployment, particularly in unskilled labor markets, they also significantly improve income inequality and reduce working poverty. For example, higher wages are theorized to stimulate the economy by boosting aggregate demand, leading to higher productivity and consumer spending[1]. Askenazy specifically used an “endogenous growth model” – an economic theory that explains economic growth as being driven by factors inside the economy, rather than external influences – in an open economy to study the impact of minimum wage on an innovative country, finding that it accelerates long-term growth by boosting R&D and production. This challenges traditional views and supports the case for raising the minimum wage. This study reviews both the potential advantages and disadvantages of higher minimum wages documented in the literature.

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2. Literature Review

Askenazy's results indicate that higher minimum wages accelerate long-term growth by boosting R&D and production, challenging traditional views and supporting the case for raising the minimum wage. Further supporting this perspective, findings by Hansen, Green, and Brown suggest that minimum wage increases have a weak impact on overall unemployment but contribute to greater income equality and job stability. Hansen, Green, and Brown find that minimum wage increases have a weak impact on unemployment but contribute to greater income equality and job stability. Brown suggests that the inflated denominator fallacy-where most workers earn above the minimum wage-and incomplete coverage of minimum wage laws account for its minimal impact on employment [2]. In addition, the effect minimum wage has on employment is often misrepresented: research arguing against minimum wage often confuses the unemployment of teenagers with adults. In reality, increases in unemployment among adult workers are negligible compared to those among teenagers [3]. Conversely, other research highlights the adverse effects of low-wage strategies. Hansen examined how low-wage strategies adopted by corporations to remain globally competitive and lower labor costs, highlighting how these strategies often led to negative outcomes and supporting the benefits of higher minimum wages [4]. Reduced labor costs had minimal impact on unemployment and job creation. What's more is the resulting increase in income inequality, job instability, and reduction in production. According to the arguments held by these economists, increases in minimum wage have benefits such as increases in income equality, job stability, production, and R&D growth, which ultimately lead to increases in production.

On the contrary, there are also argued downsides to a higher minimum wage. First, Brown's research highlighted the negligible effects minimum wage has on poverty [2]. This is largely because families affected by poverty often do not have workers at all, or have workers who can work enough hours in a year to get past the poverty line [2]. Thus, while minimum wage may not significantly impact unemployment, it also does not noticeably affect poverty levels. Since market intervention can lead to inefficiencies and market failures [2], a higher minimum wage may be overall harmful. Classical economists argue that lower labor costs, rather than minimum wage increases, promote higher employment, development, and global competitiveness [4]. Foreign companies might shift production to countries with lower labor costs, as demonstrated by Deborah L. Swenson's research on domestic and foreign automotive producers in the U.S. from 1984 to 1993 [5]. Japan is less responsive to changes in labor costs, material costs, and exchange rates compared to the U.S. [5]. This inelasticity suggests a commitment to existing supply chains and production methods, likely due to a preference for long-term stability or reliance on Japanese technologies and parts. Still, Swenson argues that Japan's decision to establish production facilities abroad is not solely driven by the desire to bypass trade restrictions. Factors like production costs and real wages also play a role [5]. The argument is that if Japanese companies' main goal to set up factories in the United States was to avoid trade restrictions, they would have only met the minimum conditions needed to bypass these laws. Furthermore, foreign automotive companies' sensitivity to factors such as production costs in the United States further backs up this theory [5]. Thus, adding to the defense for lower labor costs for the overall benefit of the economy.

All in all, whether increases in minimum wage are beneficial or harmful to the economy is heavily influenced by many factors, and there are many sides to the issue. We believe that by narrowing down the scope of the research, we will be able to gauge the nuances in this contentious debate. By analyzing a specific industry in a few select countries, we will be able to recognize and theorize why minimum wage laws are sometimes beneficial to the economy and sometimes adverse. To expand on the existing research, we will look at whether minimum wage hikes positively affect production by looking at this issue through a historical lens, analyzing

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particular years in specific countries. We selected the automotive industry for analysis due to its high concentration of minimum wage workers, which likely amplifies the impact of wage hikes on production, leading to a more noticeable correlation.

In addition to the direct impact on production costs and demand, there are other benefits that encourage production that can be the result of an increase in the minimum wage and should be considered during our analysis of different countries and their affected production levels. For example, a study done by Flug and Galor focused on how minimum wage impositions affected the composition of a country's skilled and unskilled labor in an industry [6]. Flug and Galor's theoretical analysis showed that imposing a minimum wage on unskilled workers in economies producing both skill-intensive and non-intensive goods leads to short-term unemployment among unskilled workers [6]. As a result, production shifts towards complete specialization in skill-intensive goods, increasing the ratio of skilled to unskilled labor used in production [6]. This occurs because, in a simplified economy, increasing the minimum wage for unskilled workers increases the cost of employing these workers, and thus shifts the country's comparative advantage towards skill-intensive goods that require skilled workers. In effect, the imposition of a minimum wage theoretically influences the comparative advantage in production in labor-intensive industries such as the automotive industry. It creates an incentive for trade in economies that previously had not engaged in trade, reverses the pattern of trade in economies that had exported non-intensive goods, and increases the volume of trade in economies that had exported skill-intensive goods [6]. Therefore, when we are doing our analysis of the United States, Japan, and China, this is a theory we will be keeping in mind. In the long run, countries with economies that contain predominantly unskilled labor may benefit more from this increase in the minimum wage, as a hike in the minimum wage may have a greater influence on their shift from unskilled to skilled labor because of this lower baseline.

Since Flug and Galor's theory is based on a theoretical model which is extremely simplified, it would also be beneficial to expand on this model by looking at it through a historical lens to get a more comprehensive understanding of how certain events and historical contexts may have influenced the theoretical predictions.

Minimum wage represents just one of several factors influencing production levels. Our analysis must also consider other aspects, such as labor availability, productivity, and government regulations, which affect a country's appeal for automotive manufacturing. In this context, Warokka, Subekti, Mindarta, Pambudi, and Idris found that while Japan, China, and Korea specialize more in upstream production, countries like India specialize in downstream production [7]. Factors such as high labor availability, high labor productivity, and favorable labor and trade regulations have a positive effect on the growth of the automotive industry. This is evident in China's rapid development of its automotive industry in the 2000s, going from 2,069,069 units in 2000 to 25,720,665 units in 2019, about an increase of 12 times [8]. China's immense labor force of over 700 million workers meant very high labor availability [9]. Additionally, China's favorable trade regulations, including joining the World Trade Organization (WTO) in 2001 and adopting a more open market with reduced tariffs and lower local contributions, contributed to industry growth [8]. These reduced barriers to trade and production from foreign companies allowed for more foreign direct investment and cheaper automobiles, which drove production and consumer demand. Furthermore, the involvement with the WTO meant an increase in private ownership, allowing for lower prices and more buying power from consumers [8].

Beyond these structural and regulatory factors, both real exchange rates and real wealth have also historically affected production. Klein and Rosengren examined the relationship between the real exchange rate and foreign direct investment (FDI) in the United States [10]. The real exchange rate affects real wealth and production costs, whereas a stronger real exchange rate makes things more expensive for foreign investors, potentially reducing FDI. Data on four FDI

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measures in the U.S. from seven industrial countries show that real wealth significantly affects FDI, while relative wages do not [10]. This is explained by the existence of imperfect capital markets, where the resulting increase in relative wealth from a stronger exchange rate is correlated with a more efficient financial market and more accessible capital. Thus, real exchange rates and real wealth need to be considered when analyzing production in the automotive industry considering their impact on FDI.

This topic can also be analyzed through a historical approach. Government regulations such as trade barriers and subsidies in China, and trade quotas, differentiated taxes, and tax cuts for eco-friendly vehicles in Japan, have stimulated automotive industry growth in several countries [11]. This was illustrated by research done by Dmytriiev et al. In the US, the competition between the big three automotive companies constantly drove cheaper production costs and more efficient production [11]. During the Great Depression, government interventions like fair competition policies, minimum wage laws, and maximum work hours effectively boosted development in the U.S. automotive industry [11]. Furthermore, joint ventures and other government interventions, such as subsidies, encourage automotive companies to restructure/modernize their vehicles [11].

Previous research has examined the effect minimum wage hikes have on the economy, and there has been much debate on whether the overall effect is positive or negative. However, these research papers have not examined any specific industry or country, and therefore do not provide us with the differences and subtleties each industry and country possesses. Therefore, our research paper will aim for a more industry-specific and country-specific approach to expand our knowledge on the subject, looking at how minimum wage may affect production levels. Consequently, this will also provide for a more comprehensive understanding of the effect minimum wage has on the economy. Dmytriiev et al examined the role of certain government policies on comparative production advantages, and similarly, this only provides us with a general view of the topic. It does not show us the distinctive effects specific government policies, such as minimum wage, have on production in particular industries. Our research will focus on the impact of minimum wage on automotive production in the U.S., Japan, and China, providing a detailed understanding of its advantages and disadvantages. Our research yielded strong positive correlations of minimum wage and automotive production in Japan and China, but a negative correlation of minimum wage and automotive production in the U.S. The disparity in the results indicates that the effect of minimum wage on production is highly context-dependent, shaped by broader economic conditions and trends.

3. Methodology

Our first step in our research was to find data on major strikes that affected minimum wage in the automotive industries in China, Japan, and the United States. Data on the increases in the minimum wage in the U.S. was collected from research by Chie Aoyagi, et al., Fang, Tony, and Carl Lin, Fox Business, Nikkei Asia, Labour Notes, The Athenaeum, Autoblog, Los Angeles Times, Reuters, and Nippon.com [12-21].

Then, we compared the annual automotive production of the year when the strikes occurred to the previous year, finding the percentage change in total automotive output. Data on the quantity of automotive production in the U.S. was collected from the Bureau of Transportation Statistics, Federal Reserve Bank of St. Louis, and Statista [22-24]. Automotive production data on Japan was collected from CEIC Data, Marklines Automotive Industry Portal, and Trading Economics [25-27]. Data on the quantity of automotive production in China was collected from Marklines and Trading Economics [28,29]. All the years we chose for our analysis were selected through a Google search on years in which labor strikes led to minimum increases. We examined strikes that happened as early as in the late 1990's. We then plotted our data for each

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year we analyzed onto a linear regression, as it was the simplest way to measure the correlation between an independent and dependent variable. Finally, we determined the strength of the correlation between the percentage change in minimum wage and the percentage change in automotive production. Lump sum wages were not included in the percentage increase in minimum wage for our regression model.

4. Results

Based on the analysis results of China, Japan, The United Stares, in Table 1-3, it can be seen that the automotive production in the United States shows a negative correlation with minimum wage, indicated by a correlation coefficient of approximately -0.612. In contrast, automotive production in Japan and China exhibits a strong positive correlation with minimum wage, with correlation coefficients of 0.584 and 0.880, respectively. If the correlation is positive, it is stronger the closer it is to 1. On the contrary, if the correlation is negative, it is stronger the closer it is to -1. Consequently, automotive production in the United States has a weaker negative correlation with minimum wage, while the correlations in China and Japan are much more strongly positively correlated with production.

Table 1. Correlation of minimum wage and automotive production in China

Year	Percent Increase in Minimum Wage Set by Law/Union	Percent Increase/Decrease in Automotive Production Compared to Previous Year
2004	40	14.19
2010	53.33	33.96
2021	9.5	7.3
Coefficient of Correlation：0.880231976		

Table 2. Correlation of minimum wage and automotive production in Japan

Year	Percent Increase in Minimum Wage Set by Law/Union	Percent Increase/Decrease in Automotive Production Compared to Previous Year
1993	3.19	-9.41
2008	2.33	-0.151
2016	3	-0.79
2023	3.93	14.83
Coefficient of Correlation: 0.583634764		

Table 3. Correlation of minimum wage and automotive production in the U.S.

Year	Percent Increase in Minimum Wage Set by Law/Union	Percent Increase/Decrease in Automotive Production Compared to Previous Year
1998	8.42	-1.06
2015	2.3	3.82
2019	64.71	-3.58
2023	11	10.15
Coefficient of Correlation：-0.612048621		

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5. Discussion

The divergent correlations between minimum wage and automotive production observed in the United States, Japan, and China can be explained through several interconnected economic channels. These include differences in baseline economic conditions-such as initial wage levels, real wealth, and skilled labor availability-as well as the influence of external factors like government policies, technological progress, business cycle fluctuations, shifts in market demand, and exchange rate movements. The following sections examine some of these potential channels in detail. Considering the negative correlation between minimum wage and automotive production in the United States and the positive correlation observed in Japan and China, this disparity may be explained by the varying baseline minimum wages and economic conditions. By examining the broader economic conditions which may have affected automotive production, we will be able to get a clearer understanding of our results.

5.1. Baseline Economic Conditions

Countries with cheaper labor, like China and Japan during the years analyzed, may benefit from an increase in the minimum wage. A higher minimum wage allows for an increase in income equality, job stability, R&D, and worker's income. Increases in these factors are contributors to an increase in automotive production in the long run. Even with an increase in the minimum wage, these countries will not lose their comparative advantage in the production of automobiles because the minimum wage shift is not enough to take away their cost advantage. In contrast, the United States, with a higher baseline of minimum wage, will not benefit as much from this increase, but rather companies will shift their production to countries with lower labor costs, ultimately decreasing domestic automotive production. This was reflected in our data, where the two countries with cheaper costs of automotive labor, China and Japan, saw minimum wage increases positively correlated with automotive production. Conversely, the United States, with comparatively more expensive labor, saw the contrary.

5.2. Real Wealth and Consumer Spending

Real wealth and consumer spending are another important consideration in the minimum wage debate. Japan and China had a lower level of real wealth compared to the U.S. during the timeframe of our analysis. Therefore, a raise in the minimum wage meant a more significant boost to consumer incomes, leading to higher demand for Automotives, and thus higher production. Real wealth does not solely endorse automotive production through increases in consumer spending – it also encourages production through foreign direct investment, which we discussed previously in the literature review section of this research project.

Subsequently, an increase in the minimum wage of China and Japan's automotive industry likely increased the real wealth, promoting more FDI, and thus allowing for more production. This contrasts with the U.S., where an increase in the minimum wage would be less effective on the relatively higher level of real wealth and consumer incomes. Thus, the costs associated with a higher minimum wage, including increased unemployment, loss of global competitiveness, and efficiency loss and market failures due to government intervention, would not be as effectively offset by the weaker rise in demand. The positive correlation of minimum wage and automotive production in China and Japan and the negative correlation in the U.S. highlights how the disparity in the levels of real wealth need to be factored into the effect minimum wage has on production.

The substantial growth in real wealth across China's economy – most notably the income of the lower 50% of adults in China growing to be five times the amount in 1978 – cannot be fully attributed to the increases in minimum wage [30]. Rather, other economic factors come into play. In addition, other factors likely have a role in keeping the income in the U.S. stagnant, where the median household income stayed stagnant from 2000 to 2015, and only saw an

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average annual growth rate of about 2.1% from 2015 to 2018 [31]. Real wealth, as we have already established, has a significant role in impacting automotive production, so our results relating minimum wage to automotive production are weakened because of these external factors. Specifically, the substantial growth of real wealth in China may have contributed to the positive correlation of minimum wage and automotive production, and the stagnating real wealth in the U.S. may have contributed to the negative correlation. Although minimum wage has a role in shifting the real wealth, we need to keep in mind that many other economic factors may also complement or counteract the effect it has.

5.3. Availability of Skilled Workers

The availability of skilled workers in an economy is another factor that must be taken into account when considering the effect of minimum wage on automotive production. If we consider Flug and Galor's theory, a country with relatively less availability of skilled workers, like China and Japan during our analysis compared to the U.S., would see an increase in the number of skilled workers after an increase in the minimum wage. A higher availability of skilled workers allows for economies to have higher productivity, stronger global competitiveness, and their workers to earn higher incomes, consequently contributing to an increase in production in the long run. These were benefits which the economies of China and Japan would receive following their increases in the minimum wage. Countries with an already high availability of skilled workers such as the United States would see a less substantial increase in the availability of skilled labor compared to a country like China with initially less availability in skilled labor. The costs associated with a higher minimum wage, including the cost of increased unemployment, loss of global competitiveness because of the higher cost of labor, and efficiency loss and market failures due to government intervention, may overshadow the advantages in these countries. This was reflected in our data, where the two countries with a lower availability of skilled workers, Japan and China, experienced a positive correlation of minimum wage and automotive production, and the country with a higher availability of skilled workers, the U.S., experienced a negative correlation.

5.4. Interaction with Other Economic Conditions

Other economic conditions, including government policies, technological advancements, the economic cycle, market demand fluctuations, and exchange rates, may also interact with minimum wage to explain the variations in automotive production in the United States, Japan, and China. Individual years that were included in the regression analysis that led to the final results will be analyzed. We will discuss how other economic conditions may have intersected with minimum wage to influence automotive production in each individual year; thus attempting to explain the disparity in the correlation coefficient in the three countries.

5.5. Government Policies

Government policies interact with minimum wage to affect production. Minimum wage increases tend to be more harmful to automotive production if they are implemented alongside government policies that are also harmful to automotive production. For example, in the 1990s of Japan, trade barriers were implemented by major foreign markets such as the U.S. and Europe in reaction to the weakening world economy, discouraging Japanese exports to foreign markets. The minimum wage increase in 1993 was correlated with a 9.41% decrease in Japanese automotive production likely due to companies being constrained by these international tariffs. They caused the Japanese automotive industry to struggle with falling levels of demand, tighter budgets, and higher unemployment. Therefore, the resulting higher production costs from the increase in the minimum wage may have caused companies, which were suffering from constrained budgets and decreased demand, to cut production or lay off workers. Additionally, the increase in the minimum wage on top of the tariffs made Japanese

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automobiles more expensive and less attractive to international consumers. Government policies may influence minimum wage to harm automotive production, but they have also shown to lead minimum wage to increase automotive production. Increases in the minimum wage tend to positively influence automotive production when they are implemented alongside government policies that are beneficial to automotive production. This was exemplified in the 33.96% increase of automobile production in China, 2010, where the government subsidized and cut sales tax on automobiles [32]. Consumers could buy automobiles at a lower cost and companies could produce more to meet the higher demand, and the subsidies would counteract the additional costs that came from the more expensive labor caused by the increase in the minimum wage. Therefore, the benefits of minimum wage could be achieved with substantially less costs. Likewise, the 7.3% increase in the production of Chinese automobiles in relation to increases in the minimum wage in 2021 may be explained by the government subsidizing new energy vehicles , allowing companies to produce at a higher volume and offsetting any costs related to the increase in the minimum wage. China's involvement in the WTO and their implementation of foreign policies in the 2000s – including reduced tariffs and lower local contribution – encouraged foreign companies to invest in the Chinese automotive industry. It also allowed companies to produce more efficiently, in effect contributing to the growth in automotive production. The increased investment and higher production efficiency would have offset any additional costs that arose from increases in the minimum wage. Therefore, China was able to raise the minimum wage without losing global competitiveness and increasing the unemployment rate. How minimum wage interacts with government policies to affect automotive production is partially dependent on the effect of government policies alone. That is, if government policies negatively influence automotive production, such as making automobiles more expensive, a minimum wage increase will also negatively affect production. If government policies catalyze automotive production, such as by decreasing costs or encouraging investment, minimum wage will likewise positively affect automotive production.

Technological advancements are another factor that needs to be considered when analyzing the effect minimum wage has on production. In 2023, improvements in the supply of semiconductors, a decrease in parts supply issues, and an increase in the stability of parts supply, allowed Chinese automotive companies to produce automobiles more efficiently [33]. With an increase in minimum wage, China also saw a 10.15% growth in automotive production, likely because these technological advancements allowed companies to produce at a lower cost which covered the higher cost for labor. The benefits of a higher minimum wage were gained without the cost of higher unemployment and a loss in global competitiveness.

Technological advancements may also lead to a decline in automotive production after an increase in the minimum wage. Due to the increasing quality of U.S. automobiles taking demand away from Japanese automobiles in the 1990s, Japanese automotive production declined by 9.41% in 1993 after an increase in the minimum wage [34]. The effect of higher production costs from the minimum wage hike were likely exacerbated by the already suffering Japanese automotive companies, and the benefits of minimum wage were likely not substantial enough to counteract the other economic variables that came into play. The effect minimum wage has on automotive production is partially dependent on whether technological advancements themselves are beneficial to domestic automotive companies. Generally, if technological advancements reduce production costs or increase demand, minimum wage will benefit automotive production, and if technological advancements lead to lower efficiency or decreased demand, minimum wage will have a negative effect on automotive production.

Economic expansions and downturns, or the different stages of the business cycle, also influence the effect of minimum wage on automotive production. Minimum wage increases raise the cost for companies to produce, and it also increases unemployment. During times of economic downturn, these negative effects of minimum wage will be much more harmful

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because the unemployment rates, incomes, and demand are already suffering. Consequently, companies will be constrained, and increases in the minimum wage may lead to layoffs, which may lead to production cuts due to a decline in income, or production cuts directly. The world economy slowing down in 2015 likely explains why an increase in the minimum wage was correlated with a 9.6% decrease in automotive production in the U.S. Additionally, the spread of COVID-19 in China during 2019, which weakened China's economy and led to lower demand for U.S. automobiles, potentially interacted with minimum wage to contribute to the 3.58% decrease in automotive production . The financial crisis leading to lowered demand in the United States and Europe in 2008 along with an increase in the minimum wage may have contributed to a decrease in Japanese automotive production of 0.15% [35]. Along with minimum wage hikes, Japan's weakening economy and the declining economic state of the world economy led to trade barriers which prevented exports to foreign markets such as the U.S. and Europe. The combination of these two factors may explain the 9.41% decline in Japanese automotive production in 1993 . Minimum wage increases may be associated with higher levels of automotive production if they are implemented during periods of economic growth. China's strengthening economy in 2004 alongside income increases led to an increase in demand [36]. The minimum wage was raised the same year, and its negative effects may have been offset by the increased strength of businesses, demand and incomes. The result was a 14.19% increase in automotive production in 2004 [37]. Likewise, in 2010, China saw an increase of 33.96% in the production of automobiles in relation to an increase in the minimum wage. This may be attributed to income growth and boosted demand for construction trucks . Economic expansions and downturns are an important consideration in the effect minimum wage has on automotive production. During times of economic downturn, minimum wage may be more harmful to the production of automotives than beneficial, because it can worsen the unemployment rate and cause the country to lose cost competitiveness. During times of economic expansion, minimum wage may be more beneficial overall because the harmful aspects of minimum wage are less pronounced.

Demand shifts should also be considered in the debate of the effect of minimum wage. During periods of high demand, increases in the minimum wage may be more beneficial than harmful to automotive production. Increases in demand will offset the negative implications of minimum wage. It will ease unemployment and companies will have the financial means to not be as affected by higher costs. Meanwhile, the beneficial implications of minimum wage are amplified – for example higher consumer income and R&D – with the high demand. With this reasoning, our data may be explained. The high demand for Teslas and Ford's Bronco in 2023 alongside minimum wage hikes may have contributed to the 10.15% increase in automotive production in 2023 in the U.S., reflecting how demand fluctuations may interact with minimum wage to affect automotive production in the United States. Furthermore, increases in the minimum wage, high demand for automobiles in North America and China, and the popularity of Nissan's new Note compact car in 2016 incentivized Japanese automakers to increase their production [38]. In 2010, China saw an increase of 33.96% in the production of automobiles , which may be attributed to the combination of a higher minimum wage with an increased demand for construction trucks . This shows how increases in the minimum wage during high levels of demand may lead to increased automotive production.

5.6. Exchange Rates

The exchange rate also affects the effect minimum wage has on production. When the currency of a country is stronger, demand from foreign countries will decrease. The lower demand will lead to companies producing on a tighter budget. A raise in the minimum wage would lead to higher production costs, forcing companies to either cut production or lay off workers. Thus, a minimum wage increase during periods when the currency is strong may lead to decreases in

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production. This was apparent in the U.S. in 2015, when the U.S. dollar was relatively expensive [39]. The minimum wage hike led to a 9.6% decrease in automotive production because it was implemented during a time of the U.S. dollar's strength.

Likewise, the 9.41% decline in Japanese automotive production in 1993 may be attributed to the intersection of the strong Japanese yen and an increase in the minimum wage.

5.7. Synthesis of Explanatory Channels

The disparity in our results – where automotive production and minimum wage in Japan and China had correlation coefficients of 0.908 and 0.880, respectively, compared to the -0.595 U.S. correlation coefficient – may be explained by the varying economic conditions and trends. The discrepancy in the baseline minimum wages, availability of skilled workers, and level of real wealth in each country accounts for the differing results of minimum wage hikes. Countries with a lower baseline minimum wage, availability of skilled workers, and level of real wealth tend to see growth in automotive production correlated with minimum wage raises. In contrast, countries with higher levels of these factors tend to benefit less from increases in the minimum wage. Furthermore, minimum wage interacts with government policies, the business cycle, technological advancements, shifts in market demand, and exchange rates to affect production. In general, minimum wage is overall beneficial to automotive production if these economic conditions themselves positively influence automotive production. Minimum wage may contribute to a decreased level in automotive production if these economic conditions themselves negatively influence automotive production. Each country analyzed experienced differences in these economic conditions; thus, the disparity in our results may also be accounted for by these varying economic conditions.

5.8. Limitations and the Role of External Factors

It is important to note that although minimum wage has a role in affecting the levels of automotive production, production is also significantly affected by other economic conditions that can lead to changes independent from the fluctuations of minimum wage. The economic conditions and trends mentioned previously – including government policies, the business cycle, technological advancements, shifts in demand, and exchange rates – are examples of variables that influence automotive production and weaken the correlation of minimum wage and automotive production in our analysis. For example, China's involvement in the WTO and their implementation of foreign policies in the 2000s was discussed to interact with minimum wage to positively affect automotive production. However, this factor likely contributed to higher levels of automotive production independent from increases in the minimum wage. As the growth in Chinese automotive production in 2004 is likely influenced by these policies, the correlation of minimum wage and automotive production the same year is weakened. Similarly, the other economic conditions and trends influence automotive production and weaken the correlation of minimum wage and automotive production change in our analysis. Exchange rates, for example, tend to affect the level of international demand for domestic goods; when a currency is strong, demand tends to decrease, therefore leading to lower production levels. Other major trends also contributed to the growth in the automotive industry in Japan and China and decline in the U.S. For instance, the rising level of competition from foreign manufacturers against the U.S. companies during the past decades contributed to the decline in domestic automotive production. The rapid economic growth and foreign partnerships – which led to the sharing of technological expertise – led to the rapid increase in production in China. These are just a few of many external factors which contributed to the positive correlation of automotive production with minimum wage in Japan and China and negative correlation in the U.S. Thus, it would be beneficial for future research to attempt to control these variables to find a more definitive correlation between minimum wage automotive production.

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6. Conclusion

In this research paper, we used data analysis and case studies to explore the effect minimum wage has on automotive production in the United States, Japan, and China. Our analysis revealed that while increases in minimum wage are negatively correlated with automotive production in the United States, they are positively correlated in Japan and China. The discrepancy in the baseline minimum wages, availability of skilled workers, and level of real wealth in each country accounts for the differing effects of minimum wage on automotive production. Additionally, the disparity in the results may be accounted for by economic trends such as government policies, technological advancements, economic growth/downturns, changes in market demand, and exchange rates influencing the effect minimum wage has on automotive production. Thus, our research suggests that the extent minimum wage is beneficial to the economy is dependent on these economic conditions and trends that vary in each country. External factors weaken the correlation of increases in the minimum wage and automotive production, and it raises the question of the true extent to which minimum wage influences automotive production. This highlights the need for further research to isolate the impact of minimum wage from other variables. The causation between minimum wage and automotive production can be strengthened in future research through an expansion in the timeframe being analyzed, so certain external factors such as economic downturns, technological advancements, and changes in policies are less prevalent. Furthermore, it may be helpful to analyze specific segments in the automotive industry, such as luxury or electrical, and specific regions within a country to see the degree to which different policies, characteristics, and economic conditions have on automotive production. It may also be helpful to control confounding variables through a multivariate regression, incorporating variables such as economic growth rates to better isolate the independent variable. To add on to the minimum wage debate, future research could explore the impact of minimum wage on the availability of skilled workers in the automotive industry, as this factor significantly affects industry growth and production.

References

[1] Askenazy, P. (2003). Minimum wage, exports, and growth. European Economic Review, 47(1), 147–164. https://doi.org/10.1016/S0014-2921(02)00187-3

[2] Brown, C. (1988). Minimum wage laws: Are they overrated? Journal of Economic Perspectives, 2(3), 133–145. https://doi.org/10.1257/jep.2.3.133

[3] Green, D. (2015). The case for increasing minimum wage. Canadian Centre for Policy Alternatives. https://www.policyalternatives.ca/sites/default/files/uploads/publications/BC%20Office/2015/04/CCPA-BC-Case-for-Incr-Minimum-Wage_0.pdf

[4] Hansen, S. (2001). The impact of a low-wage strategy on state economic development. State Politics & Policy Quarterly, 1(3), 227–254. Retrieved from https://www.jstor.org/stable/40421430

[5] Swenson, D. (1997). The effects of U.S. trade protection and promotion policies: Explaining domestic content: Evidence from Japanese and U.S. automobile production in the United States. National Bureau of Economic Research. https://www.researchgate.net/publication/228250743

[6] Flug, K., & Galor, O. (1986). Minimum wage in a general equilibrium model of international trade and human capital. International Economic Review, 27(1), 149–164. https://doi.org/10.2307/2526612

[7] Warokka, A. (2020). Asia automotive industry: Global and country scenario. International Journal of Psychosocial Rehabilitation, 21(1), 1127–1138. https://doi.org/10.37200/IJPR/V24I1/PR200215

[8] Dolanay, S. S. (2021). Rapid rise of China automotive industry in the 2000s and history of Turkey automotive industry. China-USA Business Review, 20(1). https://doi.org/10.17265/1537-1514/2021.01.003

[9] Statista. (2023). Labor force in China from 2000 to 2022. https://www.statista.com/statistics/282134/china-labor-force/

[10] Klein, M., & Rosengren, E. (1992). The real exchange rate and foreign direct investment in the United States: Relative wealth vs. relative wage effects. Federal Reserve Bank of Boston. https://www.bostonfed.org/economic/wp/wp1992/wp92_2.pdf

[11] Dmytriiev, I., et al. (2019). The world experience and a unified model for government regulation of development of the automotive industry. Public Policy and Administration, 18(3), 46–58. https://doi.org/10.5755/j01.ppaa.18.3.24720

[12] Aoyagi, C., et al. (2016). Minimum wage as a wage policy tool in Japan (IMF Working Paper No. 16/232). International Monetary Fund. https://www.imf.org/external/pubs/ft/wp/2016/wp16232.pdf

[13] Fang, T., & Lin, C. (2015). Minimum wages and employment in China. IZA Journal of Labor Policy, 4(1). https://doi.org/10.1186/s40173-015-0050-9

[14] Fordham, E. (2019). 5 major UAW strikes in GM history. Fox Business. https://www.foxbusiness.com/industrials/history-gm-strike-uaw-auto-workers

[15] Kawakami, T. (2021). Minimum wage hikes sweep China in 'common prosperity' push. Nikkei Asia. https://asia.nikkei.com/Economy/Minimum-wage-hikes-sweep-China-in-common-prosperity-push

[16] Lüthje, B. (2010). Auto worker strikes in China: What did they win? Labor Notes. https://labornotes.org/2010/12/auto-worker-strikes-china-what-did-they-win

[17] MacIntyre, R. (2024). The incredible history of the United Auto Workers. The Athenaeum. http://theath.ca/uncategorized/the-incredible-history-of-the-united-auto-workers/

[18] Marquis, E. (2015). 5 largest manufacturing strikes in United Automotive Workers history. Autoblog. https://www.autoblog.com/2015/03/12/5-largest-manufacturing-strikes-in-united-automotive-workers-his/

[19] Nauss, D. (1998). Strike at GM facility forces 5 plants to shut. Los Angeles Times. https://www.latimes.com/archives/la-xpm-1998-jun-09-fi-57960-story.html

[20] Takenaka, K. (2023). Japan set for largest ever minimum wage hike after panel proposal. Reuters. https://www.reuters.com/markets/asia/japan-set-largest-ever-minimum-wage-hike-after-panel-proposal-2023-07-28/

[21] Nippon.com. (2023). Average minimum wage in Japan set to exceed ¥1,000 for first time. https://www.nippon.com/en/japan-data/h01751/

[22] Bureau of Transportation Statistics. (n.d.). Annual U.S. motor vehicle production and factory wholesale sales (thousands of units). https://www.bts.gov/content/annual-us-motor-vehicle-production-and-factory-wholesale-sales-thousands-units

[23] Federal Reserve Bank of St. Louis. (2024). Domestic auto production (FRED series DAUPSA). https://fred.stlouisfed.org/series/DAUPSA

[24] Statista. (2024). Motor vehicle production - United States 1999–2023. https://www.statista.com/statistics/198518/us-motor-vehicle-production-since-1999

[25] CEIC Data. (2018). Japan motor vehicle production. https://www.ceicdata.com/en/indicator/japan/motor-vehicle-production

[26] [MarkLines. (2024). Japan - flash report, automotive production volume, 2024 (manufactures, exports). https://www.marklines.com/en/statistics/flash_prod/automotive-production-in-japan-by-month

[27] Trading Economics. (n.d.). Japan car production - January 2022 data (1980–2021 historical - February forecast). https://www.tradingeconomics.com/japan/car-production

ISSN: 2688-9323

[28] MarkLines. (2021). China - Automotive sales volume, 2021. https://www.marklines.com/en/statistics/flash_sales/automotive-sales-in-china-by-month-2021

[29] Trading Economics. (2019). China car production. https://www.tradingeconomics.com/china/car-production

[30] Stanford University. (2023). The rise of wealth, private property, and income inequality in China. Stanford Center on China's Economy and Institutions. https://sccei.fsi.stanford.edu/china-briefs/rise-wealth-private-property-and-income-inequality-china

[31] Pew Research Center. (2020). Trends in U.S. income and wealth inequality. https://www.pewresearch.org/social-trends/2020/01/09/trends-in-income-and-wealth-inequality/

[32] The Guardian. (2010). China overtakes US as world's biggest car market. https://www.theguardian.com/business/2010/jan/08/china-us-car-sales-overtakes

[33] Borucki, M. (2024). After a strong 2023, what's next for North American production in 2024? Just Auto. https://www.just-auto.com/analyst-comment/after-a-strong-2023-whats-next-for-north-american-production-in-2024/?cf-view

[34] Helm, L. (1993). Curbing costs: Japan car makers gear up against industry slump. Los Angeles Times. https://www.latimes.com/archives/la-xpm-1993-07-19-fi-14734-story.html

[35] Wikipedia contributors. (2024). 2008–2010 automotive industry crisis. In Wikipedia. Retrieved September 1, 2024, from https://en.wikipedia.org/wiki/2008%E2%80%932010_automotive_industry_crisis

[36] Voice of America. (2009). China experiences fast-paced growth in car market - 2004-06-17. https://www.voanews.com/a/a-13-a-2004-06-17-15-1-67499012/282810.html

[37] Organisation Internationale des Constructeurs d'Automobiles. (2004). 2004 production statistics. http://www.oica.net/category/production-statistics/2004-statistics/

[38] Just Auto. (2017). Japanese overseas vehicle output up 6% in fiscal 2016/7. https://www.just-auto.com/news/japanese-overseas-vehicle-output-up-6-in-fiscal-2016-7/?cf-view

[39] The New York Times. (2015). Manufacturing weakens, led by drop in auto production. https://www.nytimes.com/2015/09/16/business/economy/manufacturing-weakens-led-by-drop-in-auto-production.html