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Timber housing economy in Brazil: 2013 to 2022 scenarios and crises

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ABSTRACT: Timber housing sector has several features and is essential for civil construction and forestry chains. In Brazil, the economy related to timber housing is still an unprecedented topic. Thus, the paper aimed to estimate scenarios to delimit the annual volume of this sector. Three years were studied from rare data available in the literature. From these national outcomes, projections for next years were developed. Multiple case approaches composed the literature-based methodology. As a result, the sector endured distinct internal and external economic instabilities, whose associated factors compiled political and sanitary crises, specially, with negative influences. The economy of timber housing reached an average about 500 million Dollars in 2014, being halved in 2015 due to the government crisis marked by the impeachment of the Brazilian president. From 2016 to 2019, small improvements were verified for this sector. In 2020, this favorable scenario was stagnated by the global Covid-19 pandemic. After 2021, a sectoral recovery is forecast based on positive expectations on the Brazilian economy. The two-year period of domestic presidential impeachment was more economically catastrophic than the current three-year phase of sanitary pandemic with global implications. From our economic forecasts, it was possible to attest that the Brazilian sector of timber houses is economically perceptible.

Economia da habitação em madeira no Brasil: cenários e crises de 2013 a 2022

RESUMO: O setor de habitação em madeira possui muitas características e é essencial para as cadeias florestal e da construção civil. No Brasil, a economia relacionada à habitação em madeira é ainda um tópico inédito. Assim, o artigo teve como objetivo estimar cenários para delimitar o volume anual desse setor. Três anos foram estudados a partir dos raros dados disponíveis na literatura. A partir desses resultados nacionais, projeções para os anos seguintes foram desenvolvidas. O estudo de múltiplos casos compôs a metodologia baseada na literatura. Como resultado, o setor suportou diferentes instabilidades econômicas internas e externas, cujos fatores associados compilaram crises políticas e sanitárias, especialmente, com influências negativas. A economia brasileira da habitação em madeira alcançou uma média de 500 milhões de dólares em 2014, sendo reduzido à metade em 2015 devido à crise governamental marcada pelo impedimento da presidente brasileira. De 2016 a 2019, pequenas melhoras foram verificadas para esse setor. Em 2020, esse cenário favorável foi estagnado pela pandemia global da Covid-19. Após 2021, uma recuperação setorial é prevista baseada nas expectativas positivas sobre a economia brasileira. O período de dois anos de impedimento presidencial doméstico foi mais economicamente catastrófico do que o atual triênio de pandemia com implicações globais. A partir de nossas previsões econômicas, foi possível atestar que o setor brasileiro de casas de madeira é economicamente perceptível.

Introduction

Timber construction has been a convenient solution with high levels of standardization and prefabrication (Goverse et al. 2001). Wood-based materials are very efficient ways for reaching the construction industry 2030 international goal of having carbon neutral buildings (Freitas Jr. et al. 2018). Housing prefabrication has been reaching construction markets, for example, Japan, Sweden, Germany, Sweden, and the United States (Koones 2019). These perspectives are formed by modern industrialization processes and respective intensive uses of processed wood-logs, machined lumber, structural composites, and engineered products.

But, modern solutions are hardly absorbed by construction due to conventional structure of this industry (Demirdöğen and Işik 2021), whose salient feature has been identified by the poor stakeholder management (Budayan and Çelik 2021). Cultural unfamiliarity and underestimation of timber houses are the main obstacle of people from Netherlands (Goverse et al., 2001), Germany (Gold and Rubik, 2009), Brazil (De Araujo et al. 2018b), and others.

In view of peculiar barriers and potentials that interfere, negatively and positively, with the development of the Brazilian timber housing sector, the study of this sectoral economy is fundamental to evince its importance, size and perspective in a national market dominated by masonry techniques.

Timber housing market and economy

Timber housing sector condenses multiple features, being rooted in different industry activities. The purposes and sales of timber housing sector have influenced, for instance, the economy and market of construction and forestry chains. Specific segments are affected such as architectural elements, floors, coverings, furniture, and others. In short, forestry and construction chains form the basis of timber housing sector, since they are responsible for main inputs and activities.

Timber housing market share was around 83% in Scotland, 31% in Wales, 23% in England, and 17% in the Northern Ireland (Egan Consulting 2017). Timber housing is a patent field for Estonia and Lithuania, since they are important exporters for the European Economic Area due to their lower prices and labor costs (Tykkä et al. 2010). Latvia has many forests and developed timber industries, justifying the wide use of wood for residences and small buildings and a minimal use for apartments and public buildings (Viluma and Bratuškins 2017). A small timber house market driven by a few dozen companies is available in Portugal (Morgado and Pedro 2011). Timber construction is achieving a growth phase in Sweden, while this sector is still in formative phase in Slovenia (Kuzman and Sandberg 2017). In Sweden, a better chance for new products and processes related to timber housing has been motivated by less public interference (Nord 2008).

State policies and building activities require processes with specialized actors in Austria (Nord 2008). The Netherlands demands assertive actions to stimulate innovation and use of wood in housing (Goverse et al. 2001). The construction in Denmark still needs to realize potentials and obstacles of prefabricated wooden residences (Wraber 2009).

In Asia, modern timber structural industry has developed rapidly in Japan against the Chinese scenario, whose factors were highlighted by timber imports and exports, forestry industry development, and government policies (Luo et al. 2018).

Therefore, different contrasts are verified in the timber housing around the world. In Brazil, no reports and few studies about timber housing were confirmed in the last decades. Only three studies developed complete approaches for the national territory, while other three studies addressed partial side-views on state and region issues.

Timber construction in the Southern state of Santa Catarina was featured by Claro (1991) using perceptions from forest-timber industry realities. Decades later, Oliveira (2003) rebuilt an approach for this same Brazilian region about potentialities and development of construction techniques based on woods from sylviculture. In parallel, Sobral et al. (2002) delimited timber construction industry of the Southeastern state of São Paulo through forest certification and consumption of Amazon wood. For the Brazilian scenario, Punhagui (2014) led a short approach of prefabricated house industry in a study about environmental issues for the sustainable construction. Shigue (2018) featured the Brazilian timber construction industry through a study case with some stakeholders, commercial products, and initiatives for wood promotion.

Concurrently, De Araujo et al. (2017; 2018a; 2018b; 2019; 2020;...) developed a broader sectoral survey of the Brazilian timber housing production, including a representative sampling of timber house producers with different construction systems and production activities; even so, an economic analysis was not obtained due to few sectoral information. This deficiency was attributed by De Araujo et al. (2018b) to disarticulations, since this industry – formed by smaller companies – does not have formal associations to represent members, to defend mutual objectives, and share sectoral data. Timber houses are produced and thus commercialized in different regions of Brazil, whose domestic market share has ranged from 6.6% to 6.7% as predicted by De Araujo et al. (2020) – in volume, these authors still confirm that Brazil has about 4 million timber houses against around 6 million units in England.

Despite significant volume of timber houses and presence of dense forests in Brazil, its domestic sector requires a well-organized chain. Certification of woods and buildings and financing are problems to be solved as raised by De Araujo et al. (2018).

But, timber sector is usually informal, since it does not have the routine to detail the accounting management and specify all product and production costs (Mayo Ríos and Vásquez-Peñaloza 2020).

This general condition needs to be reverted for the development of all timber-based sectors of forest chain. Scarpin and Carli (2016) suggest that a strategic route is developed under the challenge to produce goods and sustain competitiveness for industry from the insertion of products in market.

While timely strategies consider analyses of promising markets towards sustainable purposes, construction industry can start affirmative changes from the economy perception and mensuration – for example, by the sizing of economic sector of timber houses as a driving strategy to clarify the economic importance of these convenient solutions, which are more sustainable than masonry houses. Hence, the lack of economic outlook denoted the estimation of annual forecasts from the multiple case approaches to identify the recent economy volume of timber housing sector in Brazil.

Material and Methods

The present research was designed through a multiple case approach, whose method strategy was efficiently considered by Nord (2008). This method utilized official information from available papers, academic theses and institutional reports.

National data from a sectoral survey and macroeconomic results were interrelated to develop forecasts and create the first insight of the sector economy of timber housing. With regard to the available sectoral data, this study considered market volumes per timber houses sold in Brazil estimated by De Araujo et al. (2020) and respective market prices per square meter of building identified by De Araujo (2017) – the reliability and specificity of these documents were rightly regarded, since they revealed recent numerical data obtained from semi-structured interviews with a consistent sampling of 51% sector population. This interview process has been a practical methodology to forecast economic values, since it can provide reliable results as determined by De Araujo et al. (2020) and other studies as Pereira et al. (2020).

Still, the establishment of this analysis was supported by three different average sizes of the Brazilian houses considered by Tavares (2013): popular standard example (one-bedroom houses with 40 m^2 of built area), average standard (two-bedroom houses, 60 m^2), and upper standard (four-bedroom houses, 120 m^2). Hence, three scenarios (minimum, average and maximum) about building standards and sizes (popular, average and upper) were produced to generate an inclusive perspective. Since the literature has shared values for a 107-company sampling, these sums were estimated to 210 domestic developers – using a representative sectoral amount ascertained by De Araujo (2017). Using this data, the Gross Domestic Product rates were measured for the period from 2013 to 2015.

The second phase of this research involved sequential projections between 2016 and 2022. This secondary phase was supported using databanks shared by The World Bank (2022) for the Gross Domestic Product data about the Brazilian scenario.

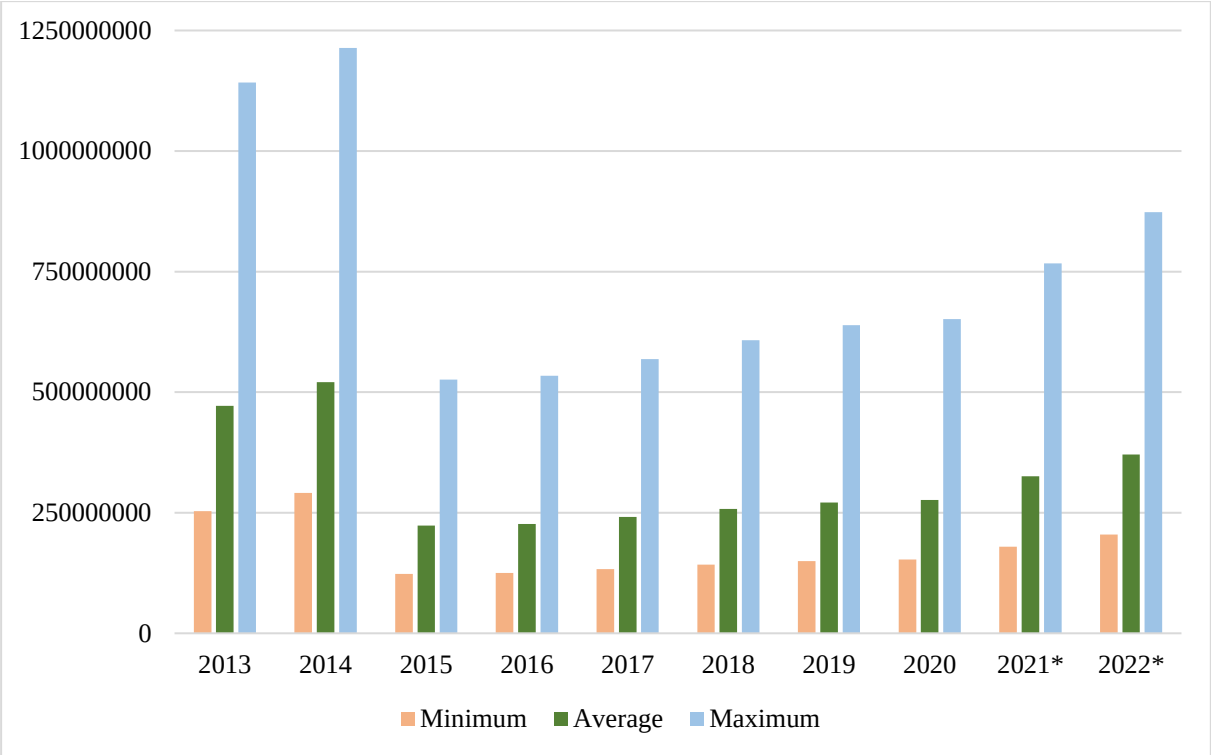
In the moment of this analysis in February 2022, two facts required further consideration. In this period, the fiscal year 2021 is still being closed by national agencies and The World Bank (2022) as well as there are still ten months left until the end of 2022. Other strategy was used to predict this period. So, a third phase was predicted using some market expectations, specifically, given by the forethought mentioned by O'Neill (2021). Forecasting phase was supported by the cross-multiplication principle to estimate values, since lack of cumulative data precluded the estimation by other methods – for example, neural networks as used by Akyüz (2019). Currency conversions (Brazilian Real to American Dollar; BRL to USD) regarded the annual exchange rates measured by Investing (2022) for the period 2013-2021, and by Nascimento (2022) for 2022.

Results and Discussion

Brazilian residences were ranked by Tavares (2013) in three main categories: minimum (popular building size and standard), average (mean aspects), and maximum (upper size and standard). Our study utilized this maximum/average/minimum ranking to typify higher/average/lower potentials, respectively.

From prices per square meter of construction technique for each housing category shared by De Araujo (2017) and annual volumes of timber houses sold in Brazil identified by De Araujo et al. (2020) for a three-year period (2013-2015), the analysis identified and delimited the economy of Brazilian timber housing sector. Those next years after this triennium were forecasted using projections cited in the method section. Each annual macro-economic projection took into account a correlation from the respective Brazilian Gross Domestic Product result and official market data of the initial triennium. Figure 1 specifies the annual economic sizes for the studied sector. Three scenarios per house category appointed an economic range, suggesting possible sizes of this sectoral economy: minimum, average and maximum. Higher sizes suggest possible better scenarios bounded to superior houses. The average sums show the highest probability of this economy size, as they blend average scenarios based on reliable outcomes shared by De Araujo (2017), De Araujo et al. (2020), and The World Bank (2022).

A slight market growth was observed in the first biennium (2013-2014), but this analyzed sector revealed a perceptible macro-economic retraction in 2015. This market depression remained up to 2020, with minimal increases, and a recovery attempt was forecasted for 2021 and 2022 (Figure 1).



* Forecasts for incomplete data at the time of this analysis; Annual values are in U.S. Dollars (USD or US$).

Figure 1. Economic sizes of the Brazilian timber housing production over the last decade period.

Economic breakdown for the year 2015 was attributed to instabilities about political and fiscal factors in the Brazilian outlook. This unstable stage was remarked by Holland (2019), after a recovery peak in 2010, as a very rapid deterioration in 2014 followed by a strong contraction in 2015-2016.

In the political sphere, this capitalist crisis and state seclusion about social losses generated by the economic recession motivated middle-class layers in protesting against the Brazil's government and, therefore, asking for some impeachment trials (Mendes 2018). The fiscal problems became even worse in 2016 and, thus, President Dilma Rousseff suffered an impeachment trial over allegations such as budgetary maneuvers (Holland 2019). Thereby, other variables were added to this presidential impeachment, for example, the government's weak skills in responding to many people demands and corruption scandals (Guazina et al. 2018). After this traumatic domestic moment with governmental changes, a typical cyclical recovery started in 2017 as remarked by Holland (2019). From that moment, the economic outlooks started to grow gradually as showed by the Figure 1, despite some slight ups and downs manifested by the Brazilian Gross Domestic Product up to year 2021, as identified by The World Bank (2022).

The 2020 to 2022 period is being marked by a setback in the global economy, since our planet is experiencing different consequences and challenges of a severe sanitary pandemic. In a matter of weeks, Remuzzi and Remuzzi (2020) identified this global spread of severe acute respiratory viral-syndrome.

As the world was unprepared against a fierce pandemic of this magnitude, its losses devastated hundreds of thousands, destroyed the livelihoods of millions and also cost trillions of dollars for global economies (Berkley 2020; Zerhouni et al. 2020). Hence, policy makers should utilize this pandemic outbreak to actually ensure a sustainable transition for a more sensible consumption (Cohen 2020). For example, forest sectors have shared social functions during the pandemic lockdown, because forestry areas provide recreational areas and may supply uninterrupted resources to industry as cited by the Confederation of European Forest Owners (2020). As suggested by the United Nations, this industry-provision blend may efficiently subsidize the global bioeconomy through a green recovery, while more sustainable goods are produced and new jobs are being generated by forestry chain (Sen and Singer 2020). At this moment, Santi (2020) recognizes that bio-based industries towards packaging and paper have increased sales in the pandemic times.

Brazilian construction advances otherwise, since its sector suffers uncertainties from pandemic, although 88% of works are active (Mendes 2020).

In the scope of timber housing in Brazil, the growth in the economic share for the year 2020 was interrupted (Figure 1), obviously due to the advance of the global pandemic hardly marked by social and commercial lockdowns. As mass vaccinations are being implemented and sectors are reopening their activities, economic growth is forecast for the years 2021 and 2022. If the current economic scenario is maintained, an economic recovery will be verified in 2022 as predicted by the Figure 1. In practice, the improvement will be surely subject to the increase foreseen by O'Neill (2022) for the Brazilian Gross Domestic Product at the end of 2022.

Numerically, the economy of timber housing sector attained average gross sums close to 500 million U.S. Dollars (USD) in 2013 and 2014 as showed by the Figure 1. For this biennium, this size covers about 11% of wood product industry in Brazil, when compared to data from the Brazilian Institute of Geography and Statistics (2016).

As this analysis tested three main scenarios (minimum, average, and maximum) for different construction categories (Figure 1), the identification of each interval between maximum and minimum values was possible then. The average interval was approximately 4.3 times, ranging from 4.5 times in 2013 to 4.1 times in 2014. The interval with higher maximum and minimum values was identified in 2014, where lower outlook would reach about 300 million USD (with primacy of popular houses), and higher scenario would have 1200 million USD (with dominance of upper class houses). Still, the condition with the lowest values was confirmed in the subsequent biennium period due to economic retraction featured by pre-impeachment instability experienced in Brazil – the outlook suggested a size about 530 million USD in the best scenario and 124 million USD otherwise (Figure 1).

The average economic size again exceeded 250 million USD in 2018 and, possibly, is expected to easily surpass 300 million USD in 2021 (Figure 1). This growth could have reached better numbers if the ruinous global pandemic had not temporarily reduced the commercial and industrial activities in Brazil in some weekly periods of 2020 and 2021.

Despite the economic retractions caused by this sanitary crisis from the end of 2019, a limited increase of 2% in the economic size of the Brazilian timber housing sector was confirmed in 2020 – it came just after three consecutive annual growths of around 5% and 6% (Figure 1). The sectoral forecast was visibly better than the negative growths of 4% tried by the Brazilian industry and 2.5% reached by the national construction sector as cited by Marko (2021). The better scenario of timber housing sector would be related to lower number of workers in the companies as verified by De Araujo et al. (2018a).

Further considerations and suggestions

Contraction and expansion portray economic periods of the business cycle, affecting both smaller and larger sectors. For example, O'Sullivan and Sheffrin (2007) realized the frequency of opposite phases in the North-American housing construction economy. The effects of such periods also influence economies of other sectors. For instance, Wherry and Buehlmann (2014) verified that one-fourth of all wood produced in the United States has absorbed by construction, which makes this sector a relevant player in the forest product industry.

Therefore, timber housing economy is less expressive in Brazil than in the United States, since De Araujo et al. (2018a) verified it is 150 times less than the wood chain dominated by panel, lumber and paper industry. This smaller size would be justified by Cesar (2002), since Brazilian customers have prioritized specific timber housing solutions such as cottages, chalets and beach houses.

As suggestions for this and other sectors, a change in our thoughts and attitudes must be put into practice and materialized in more sustainable livelihoods; a good example is affirmed by Forster et al. (2020), where restrictions on our habits and pandemic lockdowns have reduced global pollution.

In Brazil, the construction industry has been dominated by masonry houses, which are highly polluting. Therefore, sustainable alternatives should include bio-based construction techniques to replace houses built from non-renewable sources.

Our society can reboot the economies while protecting humans and nature by redesigning trade networks and supply chains to localize and support sustainable options (Pearson et al. 2020). Therefore, stakeholders' social, environmental and governance responsibilities should be regarded, since they act as dynamic capabilities that form a new competitive factor of the modern corporation (Taliento et al., 2019). After this moment with instabilities all over the world, this panorama could be reverted by our affirmative attitudes towards a healthier future.

In the scientific scope, a detailed verification about this sectoral economy may be regarded in the future studies, particularly, using semi-structural interviews to collect data with sampled companies. In addition, this strategy may be applied for other uncharted industries and recent bio-based sectors.

Conclusions

This study revealed macro-economic results for timber housing sector in Brazil, whose novelty was confirmed by a broad examination for the last decade. While the initial triennium typifies concrete estimates, the following years indicated forecasts.

This sector economy has experienced some unstable periods in the last ten years, being marked by a presidential impeachment with political and economic consequences (2015-2016), and a global social-sanitary-economic pandemic (2020-2022).

Clearly, the political-economic crisis proved to be more catastrophic phase than pandemic crisis. Both for the national economy as described in the literature and the sector studied here, the political instability affected negatively all economic results.

Timber housing sector reached a visible size in Brazil, being an important economic activity of wood product industry. This sectoral economy was in a good moment up to 2014, with an average sum over 500 million USD. After the recession in 2015, its economic potential has been halved. But, this sector showed small improvements from 2016 to 2019. Covid-19 crisis also interrupted this recent recovery in 2020, because a global recession was experienced in 2020 and even for the subsequent year. But, projections for 2021 and 2022 suggest a recovery of this studied sector in line with positive expectations of the last Gross Domestic Product in Brazil. Global economies will struggle to recover over the next decade due to this pandemic (and even other forthcoming health crises?) and related sanitary-environmental-social-economic impacts.

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